REMARKS / ARGUMENTS

For the convenience of the Examiner and clarity of purpose, Applicant has reprinted the substance of the Office Action in ***10-point bolded and italicized font.*** Applicant's arguments immediately follow in regular font.

Claim Objections

> ***1. Claims 39, 40, 51, 52, 61 and 62 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. These claims specify the type of fluid to be analyzed, while this fluid is not positively recited as an element of the structure recited in the respective parent claims. Thus, these claims do not further limit the structure of the parent claims.***

The Office's concern that the "fluid" was not "positively" recited as a limitation in the independent claims has been mooted as Applicant has chosen to amend independent claims 35, 41, 53 and 63 for reasons related to clarity and readability. Applicant reserves to a later date its right to challenge the legal substance of this objection. Applicant respectfully requests that this objection be withdrawn.

> ***2. Claims 35-62 are objected to because of the following informalities: These claims recite that they control density in the preamble of the independent claims, yet no structure for controlling density is recited in the claims. The functional statements regarding such control are structurally unsupported. Appropriate correction is required.***

Applicant has amended independent claims 35, 41, 53, and 63 to better conform the independent claims to the disclosure and teachings of the present application. Specifically, claim

35 is now directed to "An apparatus for verifying the composition of a fluid mixture." Verification of the fluid mixture is accomplished by determining the density of the fluid mixture and comparing the determined density against the desired density for the fluid.

Claim 41 has been amended by requiring a "blending unit" that mixes the fluid components together in a known ratio. The density of the resulting fluid mixture is controlled by adjusting the ratio of the fluid components in the blending section.

Claim 53 has been amended by requiring a "mixing unit" that creates the fluid mixture from at least two components according to a target ratio. The resulting fluid mixture is verified by comparing the calculated density with the target density and adjusting the ratio of the components in the mixing unit.

Claim 63 is directed to a method of preparing a fluid mixture and requires, among other things, creating a fluid mixture from a desired ratio of components and comparing the determined density to the desired density.

Support for these amendments may be found throughout the present application and specifically at, for example, page 1, lines 15-17; page 2, lines 2-4; Page 3, lines 7-9. Reconsideration and withdrawal of these objections is respectfully requested

Claim Rejections – 35 USC § 103

> *4. Claims 35-43, 46, 47, 49 51-55 and 58-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ence et al (US 6581451).*
>
> *5. Ence et al. shows a density measuring device for measuring fluid flowing in the bore of a straight horizontal pipeline including inlet and outlet*

> ***pipes 6, and a second pipe 4 connected at each end to the inlet and outlet pipes via flexible couplings 2. Pipe 4 rests on a weight-measuring unit capable of measuring the weight of the second pipe, where the weight-measuring unit can include a load cell. It would have been obvious to one of ordinary skill in the art to use the device of Ence et al to measure the density of any fluid flowing through the density measurement device.***

As argued in previous responses, Applicant disagrees with the Office's conclusion that Ence is analogous art and with its characterization of what Ence teaches and discloses. In short, and without belaboring this response by repeating those arguments in toto (which are hereby incorporated herein by reference), Ence discloses a device for measuring the density of a single component (e.g. blown housing insulation). Ence's sole purpose in determining the density of the insulation is to more accurately bill for the amount of insulation delivered. Ence does not disclose or teach that the actual density value of the "fluid" is important or that it should meet a prescribed value. Ence also does not disclose or teach how or why to adjust the density of the insulation being measured.

In contrast, the present application discloses methods and apparatuses for preparing a fluid from multiple components for use in an oil or gas well. The fluid may be mixed according to a prescribed ratio to create a fluid mixture having a density required for the well operation at hand. The density of the fluid may be measured with little or no time delay and the measured density may be compared to the desired density for verification of the fluid. If the measured density is out of specification, the ratio of fluid components may be varied to adjust the measured density accordingly.

Notwithstanding Applicant's contention that Ence is inapplicable and does not render the subject claims unpatentable, Applicant has chosen to amend the independent claims to more clearly point and distinctly claim certain aspects of the disclosed inventions. More specifically, Applicant has amended claim 35 to claim an apparatus for verifying a composition of a fluid mixture having a desired ratio of components and a desired density. The fluid mixture is verified by comparing the density measured by the densimeter with the desired density.

Ence does not disclose or teach that his "fluid" is a mixture of components (it is only insulation and air) or that the mixture has a desired ratio and density. Ence also does not disclose or teach that the composition ratio can be verified by measuring density of the fluid mixture and comparing it against the desired density. Applicant submits that Ence does not render amended claim 35 unpatentable for at least these reasons. Applicant respectfully requests that this rejection be withdrawn.

Applicant has amended claim 41 to more clearly point out and claim what Applicant seeks to protect. Amended claim 41 is directed to an apparatus for controlling the density of a fluid mixture being used in an oil or gas well. The claim requires, among other things, a "blending unit" to mix the fluid components according to a known ratio and adapted to permit adjustment of the ratio based on the measured weight of the fluid. Among other things, Ence does not disclose or teach a "blending unit" or varying the fluid mixture in the blending unit based on the measured weight of fluid in a pipe. Applicant submits that Ence does not render amended claim 41 unpatentable for at least these reasons. Applicant respectfully requests that this rejection be withdrawn.

> ***6. Regarding claims 53, although Ence et al doesn't specifically use the term "control unit" for the device 20, it is stated that "the density of the material being transported may be determined by measuring the weight of duct segment 4 with and without material in the airflow" (i.e., fluid). See column 3 lines 26—30. It is also stated at the top of column 4 that to determine the density of material flowing in the pipeline, material-free fluid is transported through duct segment 4 and weighed, and recorded, and then material is introduced into the fluid and reweighed. The difference between the weights is then determined. Thus, if not anticipated as inherent that element 20 constitutes a control unit capable of performing the above mentioned operation, it would have been clearly obvious to one of ordinary skill in the art to record the weights in a computer to perform the subtraction and density determining steps.***

Applicant has amended claim 53 to more clearly point out and claim what Applicant seeks to protect. Amended claim 53 is directed to a system for verifying an oil or gas well fluid mixture and comprises, among other things a "mixing unit" that creates the fluid mixture from at least two components according to a target ratio. The resulting fluid mixture is verified by comparing the density calculated by the control unit with the target density and varying the ratio of the components in the mixing unit as needed.

Ence does not disclose or teach a multi-component fluid mixture or "mixing unit" and does not disclose or teach the desirability of or structure for adjusting the ratio of the components to verify the density of the fluid mixture. Ence merely seeks to measure an amount of blown insulation.

Applicant submits that Ence does not render amended claim 53 unpatentable and respectfully requests that this rejection be withdrawn.

> ***7. Regarding claims 38, 49, and 60, although Ence et al does not specifically state that the cross—sectional area is uniform, one viewing Figure 1 would***

> ***interpret the cross-sectional area to be uniform, or obvious to use a uniform pipe cut out of a standard uniform pipe to save costs.***
>
> ***8. Regarding claims 43 and 55, the statement that "scale" 20 supports the weight of pipe 4 and measures the weight with a load cell makes obvious, if not inherent, that the load cell is of the compression type.***

Claims 38, 43, 49, 55 and 60 depend from the independent claims discussed above. For at least the reasons discussed above, claims 38, 39 and 60 are patentable over Ence. Applicant respectfully requests that these rejections be withdrawn.

> ***9. Regarding claims 39, 40, 51, 52, 61, 62, the antecedent fluid of the parent claims is an intended use, and is therefore not regarded as structurally limiting the measurement device claimed in the parent claims. Therefore, the named fluid is not regarded as other than a statement of intended use in these claims, and in any event, it would have been obvious to one of ordinary skill in the art to use the device to measure the density of any kind of fluid passing therethrough.***

Each of the independent claims from which these claims depend now positively recites the "fluid mixture" as a structural limitation, thereby obviating these rejections. Applicant respectfully requests that these rejections be withdrawn.

> ***10. Claims 44, 45, 48, 50, 56 and 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ence et al as applied to claims 35-43, 46, 47, 49, 51-55 and 58-62 above, and further in view of Ford et al (US-4817428).***
>
> ***11. Ence et al lacks a teaching of a weight—measuring unit positioned above the second pipe to measure weight via a tension-type load cell, or a second pipe that is curved and not uniform in cross section. However, Ford et al shows a density-measuring device where the pipe section being weighed is curved and has a non-uniform cross section. It further shows a load cell above the pipe to measure tension in line 4.***
>
> ***12. It would have been obvious to one of ordinary skill in the art to modify the pipe section 4 of Ence et al to be curved and of non-uniform cross section as taught in Ford et al, since the shape, size and uniformity are not critical to the measurement, so long as the volume of the section being weighed for density measurement is known. Further, it would have been obvious to substitute the tension—type load cell of Ford et al for the compression type of Ence et al as***

> ***both are known equivalents for determining the same function.***

Applicant disagrees that Ford is analogous art and that it is properly combinable with Ence. For at least the reasons presented above concerning the independent claims from which claims 44, 45, 48, 50, 56 and 57 depend, the referenced claims are patentable over the combination of Ence and Ford, even if proper. Applicant respectfully requests that these rejections be withdrawn.

> ***13. Claims 63-64 and 67-68 are rejected under 35 U.S.C. 103(a) as being unpatentable overe Ence et al (US 6581451) as applied to claims 35-43, 46, 47, 49, 51-55, 58-62 above, and further in view of applicant's admissions plus Heine et al (US-4285239).***
>
> ***14. Although Ence et al do not specifically teach to use the densitometer to measure and control the density of well fluids while mixing them to control their densities before injection into a well, applicant admits in the prior art measures density of the well fluids while mixing or blending them, to control their densities before injection into a well. Applicant further admits that nuclear densitometers have been used to effect the measurement of density, and Heine et al teaches that a density meter having a weighed pipe section flexibly coupled in a pipeline may be a substitute for a nuclear density meter. Therefore, it would have been obvious to use the density measurement of Ence et al in the measurement and control application relating to well fluids indicated by applicant as prior art, as motivated by Heine et al.***

Applicant does not agree with the Office's characterization of what Heine discloses and teaches or its applicability to the present claims. For example, Heine contains no disclosure or teaching of the desirability or structure for adjusting the density of the measure fluid based on the measured density. Further, the Office's decision to combine Ence and Heine has been made without any attention given to the starkly different purposes of each disclosure. Applicant submits that a sufficient motivation to combine Ence and Heine (assuming both are analogous art) has not been demonstrated by sufficient evidentiary citation. Notwithstanding the foregoing infirmities, a combination of Ence and Heine still would not provide a method of preparing a fluid for use in an oil or gas well in which the fluid density is adjusted to a predetermined target based on the measured density.

Applicant submits that the combination of Ence and Heine is improper for at least the reasons discussed above and, even if proper, the combination still does not render independent claim 63 (or its dependent claims) unpatentable. Reconsideration and withdrawal of these rejections is respectfully requested.

> ***15. Claims 65 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ence et al in view of applicant's admissions plus Heine et al, as applied to claim 63 above, and further in view of Carlson (US-6007227).***
>
> ***16. Ence et al lack a specific teaching of measuring the density while the fluid is in a process pipe on a shipping vessel or truck.***
>
> ***17. However, Carlson teaches to measure density of a fluid being processed in a truck-mounted blender, where the densitometer is a nuclear density meter, and Heine et al teaches that a density meter having a weighed pipe section flexibly coupled in a pipeline may be a substitute for a nuclear density meter.***
>
> ***18. Therefore, it would have been obvious to use the density meter of Ence et al as a substitute for the nuclear density meter in Carlson et al on a blender truck as motivated by Heine et al.***

For at least the reasons discussed above with respect to independent claim 63, dependent claims 65 and 66 are patentable over the combination of references applied by the Office. Applicant does not accede to the propriety of the combination or the Office's characterization of the prior art and reserves to a later date it right to challenge this rejection. Applicant respectfully requests reconsideration of these rejections.

Other Amendments

In addition to the amendments specifically discussed above, Applicant has chosen to make other amendments and to amend other claims wholly apart from the objections and rejections lodged by the Office. These other amendments are not made in response to a patentability rejection and may or may not be narrowing in scope.

New Claims

Applicant has presented new dependent claims 69 and 70.

CONCLUSION

Original claims 1- 34 have been canceled and independent claims 35, 41, 53 and 63 have been amended. Dependent claims have been amended as well. By this amendment, claims 35-70 are currently pending.

Applicant thanks the Examiner for his consideration and effort on this matter and submits that this application is now in condition for allowance. Applicant respectfully requests that a timely Notice of Allowance be issued in this case. The undersigned is available to discuss by telephone this amendment or any other matter pertaining to this file

Respectfully submitted,

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APPENDIX

1-34. (Cancelled).

35. (Currently amended) An apparatus for verifying the composition of a fluid mixture, comprising:

A multi-component oil or gas well fluid mixed according to a desired ratio of components to produce a desired density;

a pipeline having a bore for the flow of the fluid mixture comprising:

an inlet pipe;

an outlet pipe located downstream from the inlet pipe;

a densimeter having a first end and a second end, wherein the first end is flexibly joined to the inlet pipe, and the second end is flexibly joined to the outlet pipe for measuring the density of the fluid mixture flowing through the densimeter with no appreciable time delay; and

wherein the apparatus is adapted to verify the composition of the fluid mixture in the densimeter by comparison of the measured density to the desired density.

36. (Previously presented) The apparatus of claim 35, wherein the densimeter extends in a non-vertical direction.

37. (Previously presented) The apparatus of claim 35, wherein the longitudinal axis of the densimeter is substantially straight from the first end of the densimeter to the second end.

38. (Previously presented) The apparatus of claim 35, wherein the cross-sectional area of the densimeter is uniform for the entire length of the densimeter extending from the first end to the second end.

39. (Currently amended) The apparatus of claim 35, wherein the fluid mixture comprises a proppant slurry and has a density greater than approximately the density of water.

40. (Previously presented) The apparatus of claim 35, wherein the fluid comprises a cement slurry and has a density greater than approximately the density of water.

41. (Currently amended) An apparatus for controlling the density of a fluid mixture being used in an oil or gas well, the apparatus comprising:

an inlet pipe having a downstream end;

a second pipe having an upstream end and a downstream end, wherein the upstream end of the second pipe is in register with and flexibly connected to the downstream end of the inlet pipe, the second pipe having a bore for the flow of an oil or gas well fluid mixture;

an outlet pipe having an upstream end, wherein the upstream end of the outlet pipe is in register with and flexibly connected to the downstream end of the second pipe;

a force transducer capable of measuring the weight of the second pipe while the fluid mixture flows there through without appreciable delay; and

a blending unit in communication with the inlet pipe and adapted to mix fluid components according to a known ratio to create the fluid mixture and also adapted to permit adjustment of the mixing ratio based on the measured weight of the fluid mixture in the second pipe so that the fluid mixture actually used in the well substantially meets a predetermined fluid density.

42. (Currently amended) The apparatus of claim 41, wherein the force transducer is positioned below the second pipe and is capable of supporting the weight of the second pipe.

43. (Currently amended) The apparatus of claim 42, wherein the force transducer comprises at least one compression-type load cell.

44. (Currently amended) The apparatus of claim 41, wherein the force transducer is positioned above the second pipe and is capable of supporting the weight of the second pipe.

45. (Currently amended) The apparatus of claim 44, wherein the force transducer comprises at least one tension-type load cell.

46. (Previously presented) The apparatus of claim 41, wherein the second pipe extends in a non-vertical direction.

47. (Currently amended) The apparatus of claim 41, wherein a longitudinal axis of the second pipe is substantially straight from the upstream end of the second pipe to the downstream end.

48. (Currently amended) The apparatus of claim 41, wherein a longitudinal axis of the second pipe is curved from the upstream end of the second pipe to the downstream end.

49. (Currently amended) The apparatus of claim 41, wherein a cross-sectional area of the second pipe is uniform for the entire length of the second pipe extending from the upstream end to the downstream end.

50. (Currently amended) The apparatus of claim 41, wherein a cross-sectional area of the second pipe is not uniform for the entire length of the second pipe extending from the upstream end to the downstream end.

51. (Currently amended) The apparatus of claim 41, wherein the fluid mixture comprises a proppant slurry and has a density greater than approximately the density of water.

52. (Currently amended) The apparatus of claim 41, wherein the fluid mixture comprises a cement slurry and has a density greater than approximately the density of water.

53. (Currently amended) A system for verifying an oil or gas well fluid mixture, comprising:

a mixing unit adapted to create the well fluid mixture from at least two components in prescribed ratio, the fluid mixture having a target density;

a densimeter having a first end and a second end, the second end of the densimeter being located a selected distance downstream from the first end of the densimeter, the densimeter having a bore for the flow of the fluid mixture;

a weight measuring device capable of measuring the weight of the densimeter as the fluid mixture passes there through without appreciable time delay;

an inlet conduit establishing fluid communication between the mixing unit and the densimeter;

a first flexible connector coupling the first end of the densimeter to a portion of the inlet conduit so that the first end of the densimeter can move relative to the inlet conduit;

a second flexible connector coupling the second end of the densimeter to a portion of the outlet conduit so that the second end of the densimeter can move relative to the outlet conduit;

a control unit adapted to calculate the density of the fluid mixture flowing through the densimeter based on the weight of the of the fluid mixture in the densimeter and adapted to compare the calculated density with the target fluid mixture density; and

wherein the ratio of components in the mixing unit can be varied to make the calculated density more closely match the target density thereby verifying the fluid mixture for use in an oil or gas well.

54. (Currently amended) The system of claim 53, wherein the weight measuring device is positioned below the densimeter and is capable of supporting the weight of the densimeter.

55. (Currently amended) The system of claim 54, wherein the weight measuring device comprises at least one compression-type load cell.

56. (Currently amended) The system of claim 53, wherein the weight measuring device is positioned above the densimeter and is capable of supporting the weight of the densimeter.

57. (Currently amended) The system of claim 53, wherein the weight measuring device comprises at least one tension-type load cell.

58. (Currently amended) The system of claim 53, wherein the densimeter extends in a non-vertical direction.

59. (Currently amended) The system of claim 53, wherein a longitudinal axis of the densimeter is substantially straight from the first end of the densimeter to the second end.

60. (Currently amended) The system of claim 53, wherein a cross-sectional area of the densimeter is uniform for the entire length of the densimeter extending from the first end to the second end.

61. (Currently amended) The measuring system of claim 53, wherein the fluid mixture comprises a proppant slurry and has a target density greater than approximately the density of water.

62. (Currently amended) The system of claim 53, wherein the fluid mixture comprises a cement slurry and has a target density greater than approximately the density of water.

63. (Currently amended) A method of preparing a fluid mixture for use in an oil or gas well before the fluid mixture is pumped into the well, comprising:

flowing a first fluid having a known density through a pipeline;

calibrating a weight measuring unit that is capable of measuring the weight of a selected section of the pipeline as the first fluid flows through the selected section of the pipeline;

creating a fluid mixture for an oil or gas well having a desired density resulting from a prescribed ratio of mixture components;

flowing through the pipeline the fluid mixture;

measuring the weight of the selected section of the pipeline as the fluid mixture flows through the selected section without an appreciable time delay;

determining the density of the fluid mixture as the fluid mixture flows through the selected section of the pipeline; and

comparing the determined density with the desired density to verify the preparation of the fluid mixture.

64. (Currently amended) The method of claim 69, wherein the control system continuously measures the density of the fluid mixture as the fluid mixture flows through the densimeter.

65. (Currently amended) The method of claim 63, wherein the density of the fluid mixture is determined while the fluid mixture is in a process pipe on a shipping vessel.

66. (Previously presented) The method of claim 65, wherein the shipping vessel is a truck.

67. (Currently amended) The method of claim 63, wherein the fluid mixtures comprises a proppant slurry and has a desired density greater than approximately the density of water.

68. (Currently amended) The method of claim 63, wherein the fluid mixture comprises a cement slurry and has a desired density greater than approximately the density of water.

69. (New) The method of claim 63, wherein comparing the determined density to the desired density is done by a control system.

70. (New) The method of claim 63, further comprising adjusting the ratio of components of the mixture while creating the mixture based on the comparison of the determined density to the desired density.